

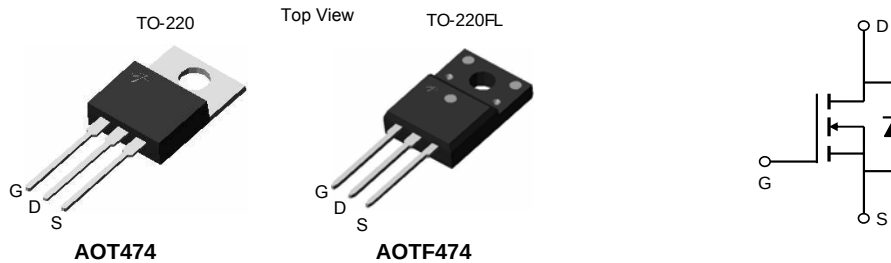
General Description

The AOT474 and AOTF474 use a robust technology that is designed to provide efficient and reliable power conversion even in the most demanding applications, including motor control. With low $R_{DS(ON)}$ and excellent thermal capability this device is appropriate for high current switching and can endure adverse operating conditions.

Product Summary

V_{DS}	75V
I_D (TO220 at $V_{GS}=10V$)	127A
I_D (TO220FL at $V_{GS}=10V$)	47A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 11.3m Ω

100% UIS Tested
100% Rg Tested



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	AOT474	AOTF474	Units
Drain-Source Voltage	V_{DS}	75		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current	I_D	127	47	A
$T_C=25^\circ\text{C}$				
$T_C=100^\circ\text{C}$	I_D	89	33	A
Pulsed Drain Current ^C	I_{DM}	240		A
Continuous Drain Current	I_{DSM}	9	9	A
$T_A=25^\circ\text{C}$				
$T_A=70^\circ\text{C}$	I_{DSM}	7	7	A
Avalanche Current ^C	I_{AS}, I_{AR}	106		A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	562		mJ
Power Dissipation ^B	P_D	417	57.5	W
$T_C=25^\circ\text{C}$				
$T_C=100^\circ\text{C}$	P_D	208	29	W
Power Dissipation ^A	P_{DSM}	1.9	1.9	W
$T_A=25^\circ\text{C}$				
$T_A=70^\circ\text{C}$	P_{DSM}	1.2	1.2	W
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	AOT474	AOTF474	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	13.9	13.9	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^{A,D}	$R_{\theta JA}$	65	65	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Case	$R_{\theta JC}$	0.36	2.6	$^\circ\text{C/W}$
Steady-State				

Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	75			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=75\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	2.6	3.4	4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$	240			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=30\text{A}$ $T_J=125^{\circ}\text{C}$		9.4 18	11.3 21.5	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=30\text{A}$		67		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.73	1	V
I_S	Maximum Body-Diode Continuous Current				128	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=30\text{V}$, $f=1\text{MHz}$	2240	2805	3370	pF
C_{oss}	Output Capacitance		355	507	660	pF
C_{rss}	Reverse Transfer Capacitance		22	36	50	pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$	1.4	2.8	4.2	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=30\text{V}$, $I_D=30\text{A}$	39	49.6	60	nC
Q_{gs}	Gate Source Charge		11	13.8	17	nC
Q_{gd}	Gate Drain Charge		8	14	20	nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=30\text{V}$, $R_L=1\Omega$, $R_{GEN}=3\Omega$		15		ns
t_r	Turn-On Rise Time			34		ns
$t_{D(off)}$	Turn-Off DelayTime			42		ns
t_f	Turn-Off Fall Time			4.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=30\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$	35	50	65	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=30\text{A}$, $dI/dt=500\text{A}/\mu\text{s}$	330	472	614	nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.

B. The power dissipation P_D is based on $T_{J(MAX)}=175^{\circ}\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=175^{\circ}\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^{\circ}\text{C}$.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=175^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

G. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

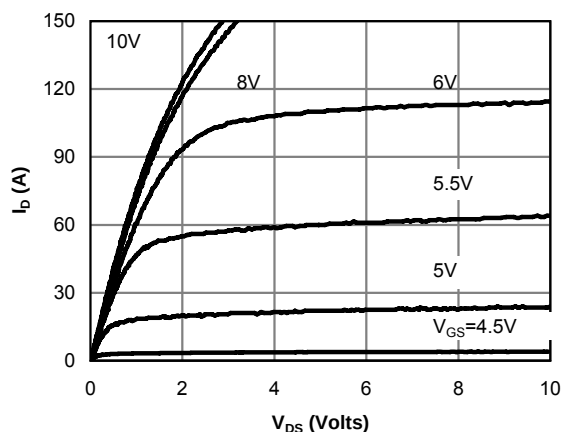


Fig 1: On-Region Characteristics (Note E)

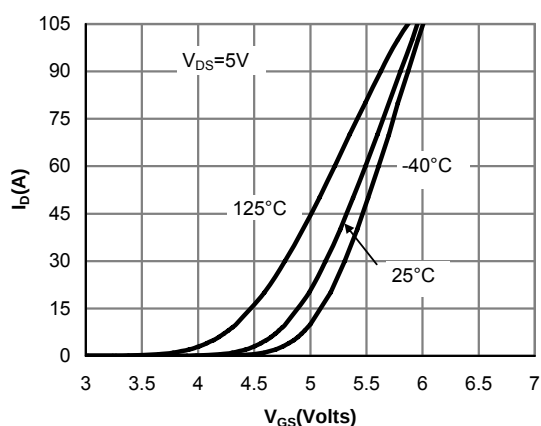


Figure 2: Transfer Characteristics (Note E)

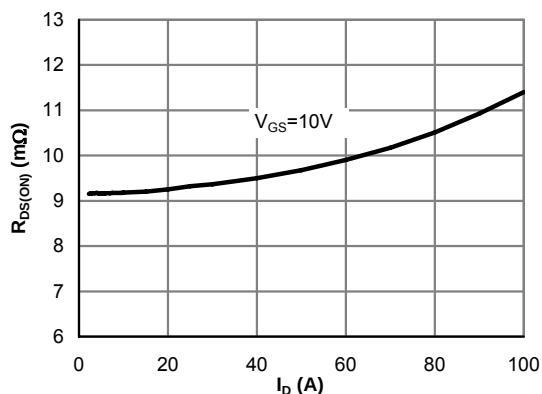


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

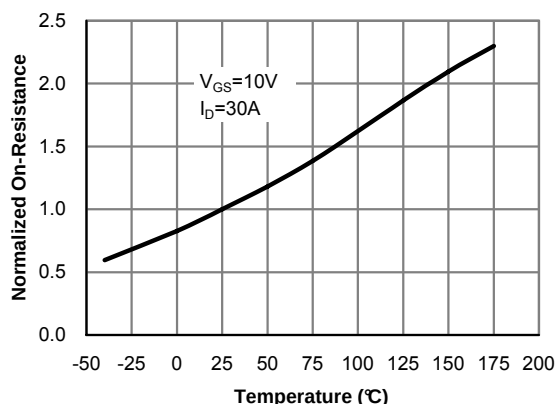


Figure 4: On-Resistance vs. Junction Temperature (Note E)

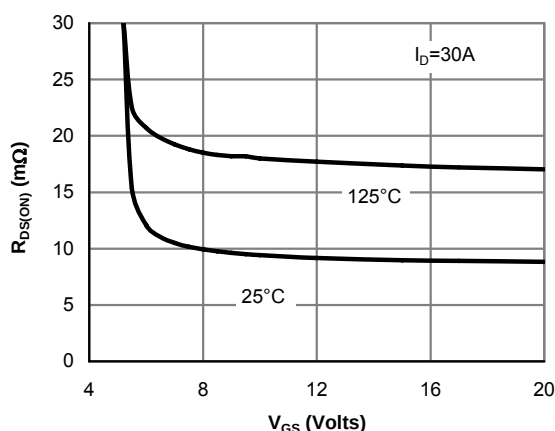


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

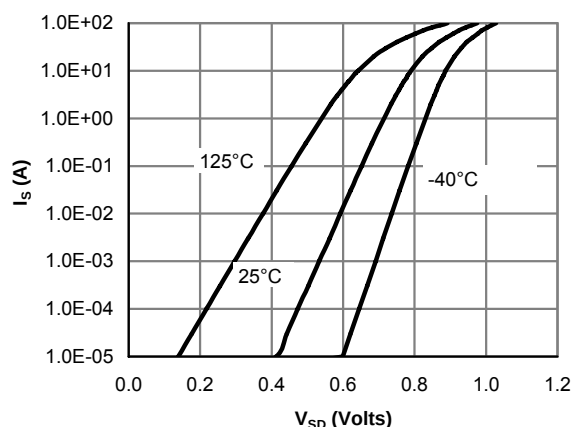


Figure 6: Body-Diode Characteristics (Note E)

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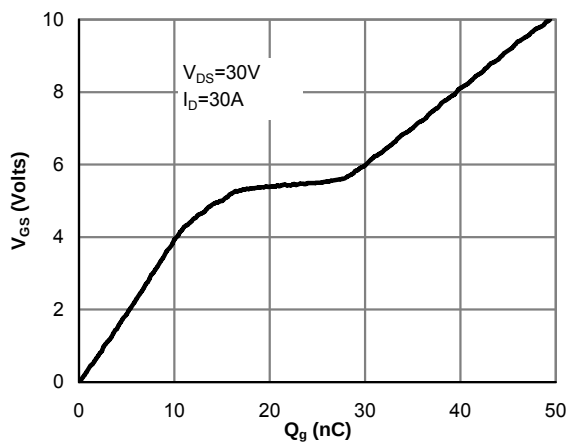


Figure 7: Gate-Charge Characteristics

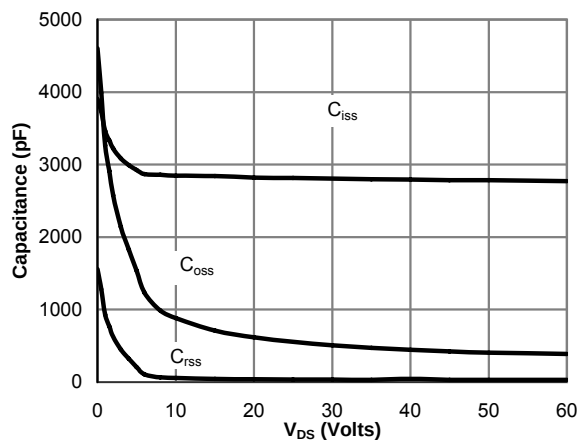


Figure 8: Capacitance Characteristics

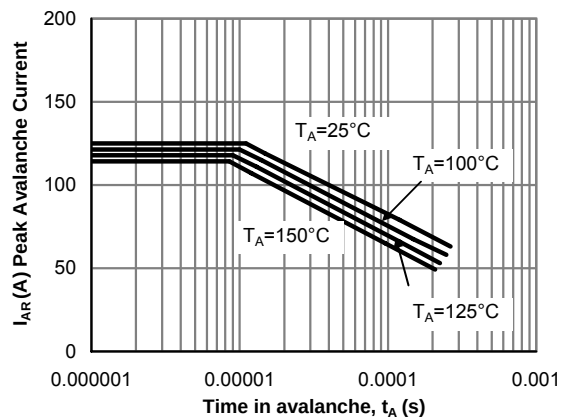


Figure 9: Single Pulse Avalanche capability (Note C)

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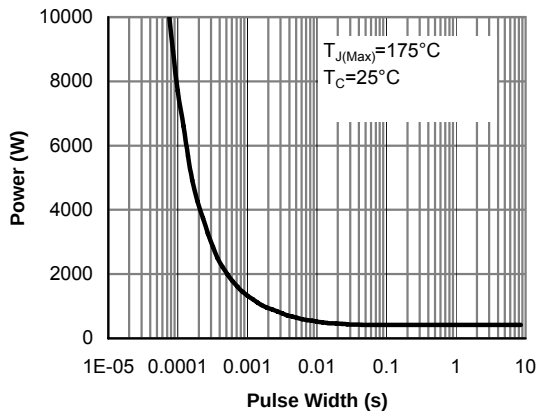


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT474 (Note F)

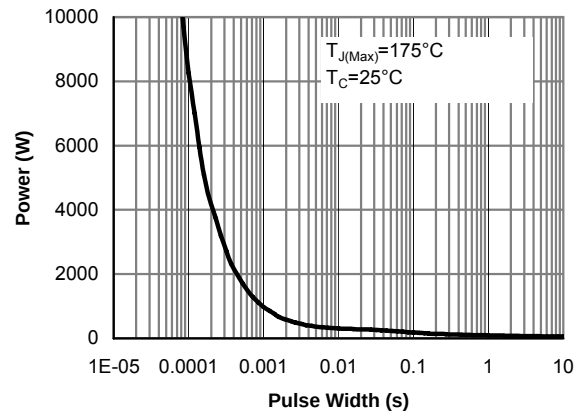


Figure 11: Single Pulse Power Rating Junction-to-Case for AOTF474 (Note F)

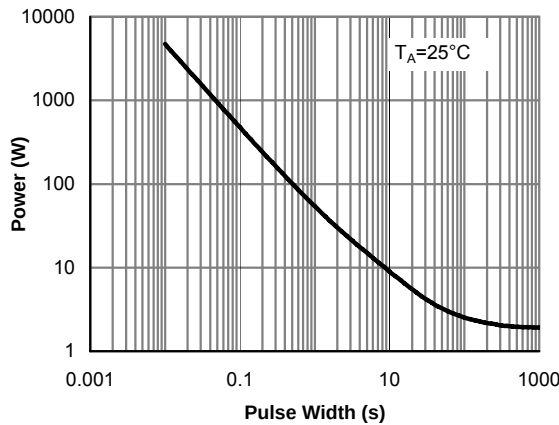


Figure 12: Single Pulse Power Rating Junction-to-Ambient for AOT474 (NoteG)

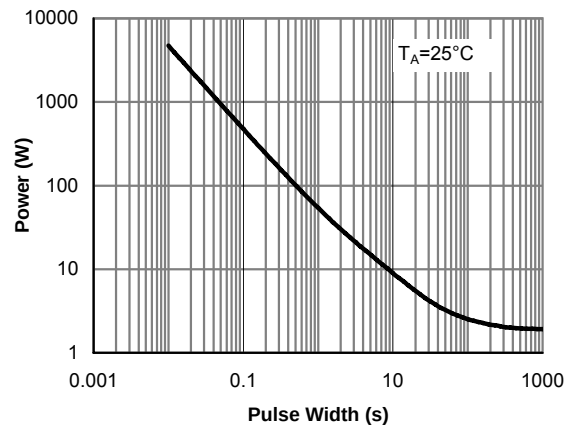


Figure 13: Single Pulse Power Rating Junction-to-Ambient for AOTF474 (Note G)

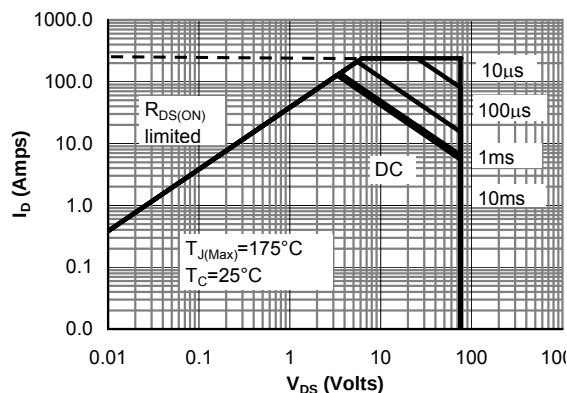


Figure 14: Maximum Forward Biased Safe Operating Area for AOT474 (Note F)

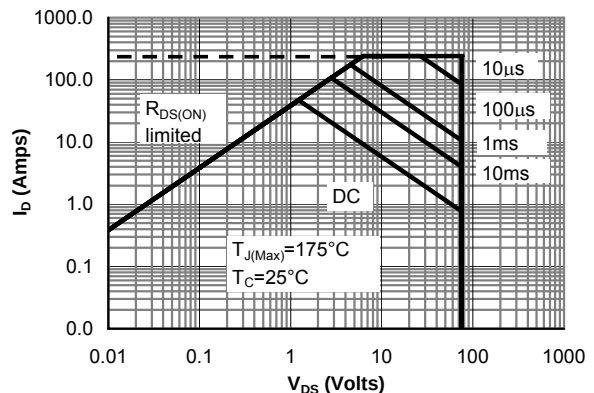


Figure 15: Maximum Forward Biased Safe Operating Area for AOTF474 (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

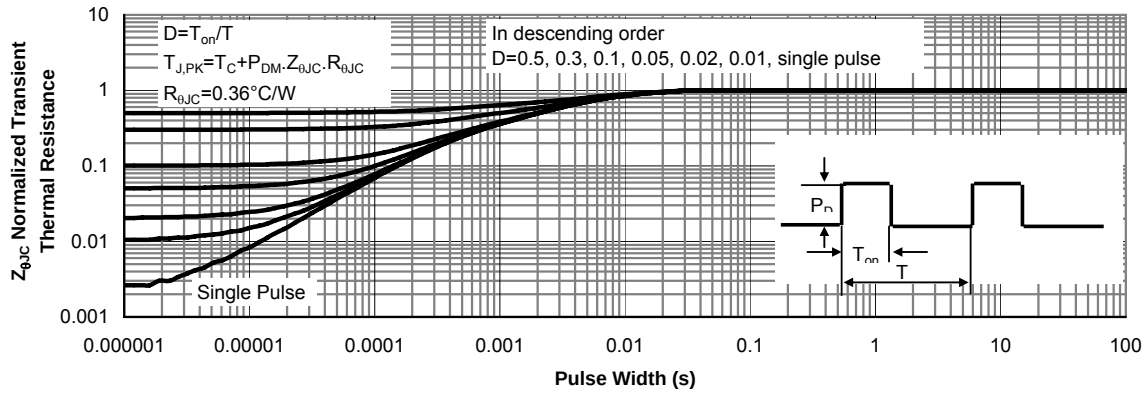


Figure 16: Normalized Maximum Transient Thermal Impedance for AOT474 (Note F)

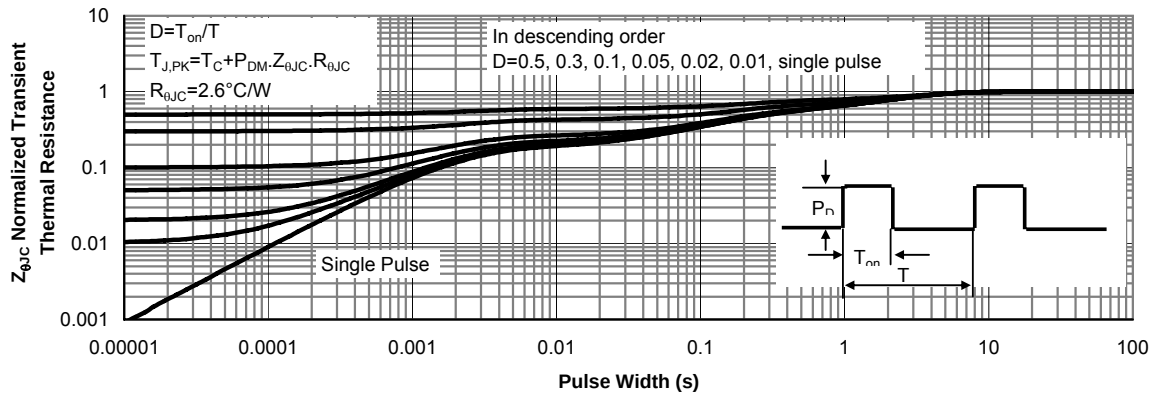
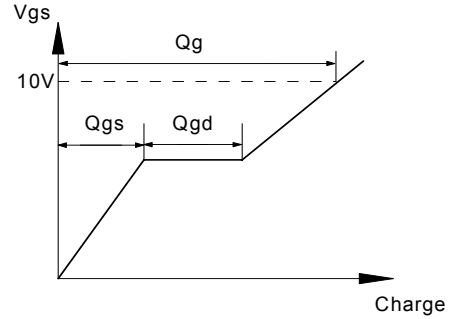
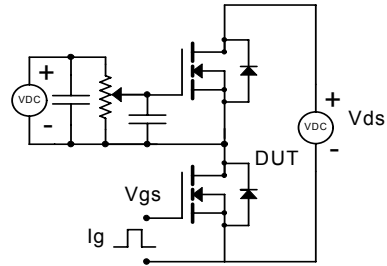
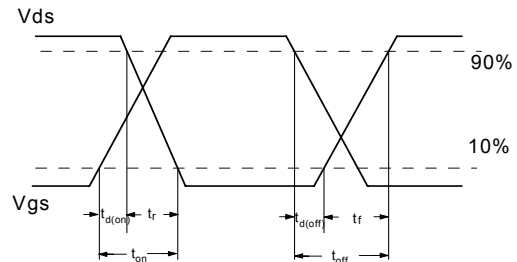
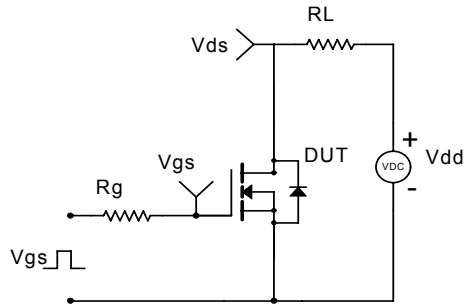


Figure 17: Normalized Maximum Transient Thermal Impedance for AOTF474 (Note F)

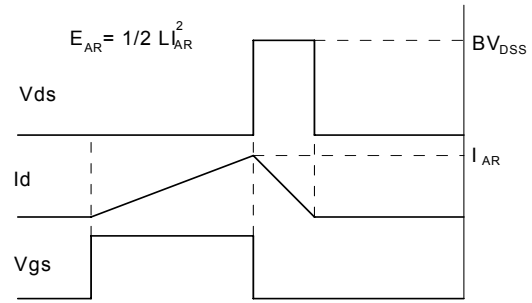
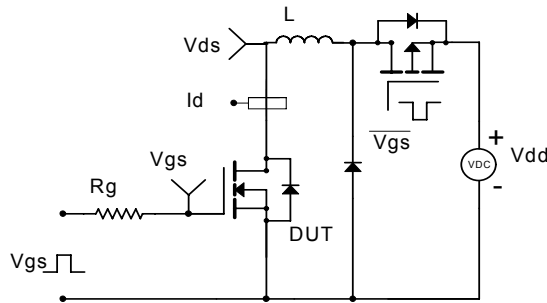
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

